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REMARKS

Claim 1 has been amended in order to more clearly point out the subject matter that Applicants' regard as their invention. As such, claims 1-10 are presently pending.

The Examiner rejected claims 1, 2, 7, 9 and 10 under 35 U.S.C. §102(b) as being anticipated by Sarwinski et al. Applicants' invention as recited in amended claim 1 is a superconducting magnet system that comprises a superconducting magnet in a cryogenic shield for providing cooling to the superconducting magnet. A cryocooler is positioned to provide refrigeration to the cryogenic shield. A cryogen vessel contains liquid cryogen. A heat pipe extends from the cryogen vessel to the cryogenic shield. The heat pipe has a wall structure allowing the liquid cryogen to wick from the cryogen vessel to the cryogenic shield.

As will be discussed, Sarwinski et al. does not show such a heat pipe as presently set forth in amended claim 1. In this regard, a heat pipe consists of a hollow tube that contains a small quantity of working fluid, in this case a liquid cryogen with the remainder of the pipe filled with the vapor phase of the cryogen. On the internal side of the tube's side-walls, a structure exerts a capillary force on the liquid phase of the working fluid. This wall structure can be a series of grooves parallel to the tube axis, but it may be any material capable of soaking up the coolant. Heating at one end of the heat pipe causes evaporation of the liquid cryogen that flows within the heat pipe due to capillary action from the wicking of the fluid in the wall structure. In this regard, see paragraphs 20 and 21 of the instant application.

Sarwinski et al. discloses a cryocooler 48 which cools liquid nitrogen which in turn cools a shield 30. The Examiner states that the cryocooler cools the shield using a liquid neon heat pipe. Sarwinski et al. discloses in Fig. 2 thermal siphon 30 that is comprised of a ballast tank 32 exposed above a heat shield 28 to cool superconducting magnetic windings. The liquid neon level 37 is maintained in the ballast tank 32. Neon gas exists the ballast tanks 32 through a gas line 38 and then flows to a mechanical cryocooler 48 disposed remotely from the

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magnetic assembly 1. The gas is condensed in cryocooler 48 and flows back to the ballast tank 32 through a liquid line 40. The liquid neon flows by gravity from the cryocooler 48 to the ballast tank 32. Hence, such arrangement acts as a thermo siphon in that the vapor flows upwardly to the cryocooler where it is condensed. The density and gravity causes the liquefied neon to flow back to ballast tank 32. The removal of matter due to evaporation causes circulation of the fluid in a typical thermal siphon mode. What is not disclosed in this patent is a heat pipe having a wall structure allowing the liquid to wick from the cryogen vessel to the cryogenic shield. Since Sarwinski et al. does not disclose the heat pipe of the present invention including a wall structure in which liquid can be transported due to a wicking action it does not anticipate the subject matter of amended claim 1.

The Examiner also rejected claims 1-10 under 35 U.S.C. §102(b) as being anticipated by Breneman et al. Breneman et al. discloses a vacuum vessel for housing a magnet system with a cryocooler 42 that cools shield 32, 34 and a cryogen vessel 52 with heat pipes 66, 68. However, again such heat pipes 66, 68 are not heat pipes in which liquid transport is obtained from wicking action as recited in amended claim 1. In this regard, as described in column 4 of this patent, lines 45-63, in operation liquid nitrogen flows out through down legs 66 having a relatively poor thermal conductivity and into up legs 66 having a good thermal conductivity. The liquid nitrogen receives sufficient heat in the up legs to boil the liquid nitrogen. The density difference of the nitrogen in the two legs causes the nitrogen to circulate. Hence, the pipes 66, 68 are not heat pipes in accordance with amended claim 1 in which the liquid transport is obtained through wicking action in the wall structure of the heat pipe.

Applicants submit that the dependent claims, namely claims 2-10 that all depend on claim 1 be allowable on the same basis as amended claim 1. In this regard, Applicants further submit that the rejection of claims 3, 6 and 8 as being unpatentable under 35 U.S.C. §103(a) over Sarwinski et al. in view of Lehmann et al. is hereby rendered moot.


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Applicants are aware that this response is being made within the second month. Applicants have therefore attached a petition to extend the time to answer to the second month together with directions to charge the deposit account of the assignee of record with the appropriate fee.

In view of the remarks set forth above and the amendments of the claims, Applicants request reconsideration of the rejection and allowance of all presently pending claims. Since the claims are in condition for allowance, prompt and favorable action is hereby solicited.

Respectfully submitted,

  
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